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AUTHOR Jordan, John E.
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ABSTRACT

Guttman's facet theory is described as a method for quantifying information concerning attitudes. It is stated that attitude items are not negatively correlated for usual populations. An attitude is defined as a delimited totality of behavior with respect to something and its components are elements of a set. The first step in facet research design is the development of a rationale. The second step is the selection of the elements in the set. Quantifying is done by mapping the elements of the set into a Cartesian space representing the rules for classification and by rank ordering according to the number of positive facet elements. Rules are given for rank ordering item content. By combining content ordering with the ordering of attitude-behavior levels, several attitude scales have been developed. The use of this method provides a basis for predicting that the correlation matrix for these attitude scales will form a simplex. There are three important aspects of facet design--methodological, theoretical, and applied. (Author/CTM)

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John E. Jordan, Ph.D.
Director General
International Rehabilitation
Special Education Network
Louisiana State University
Baton Rouge, Louisiana

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Facet Theory and Non-Metric Methods: The Quantification of the Qualitative

John E. Jordan

College of Education

Louisiana State University

One of the perennial problems of research in the social sciences seems to be the goal of adequately quantifying the qualitative. Especially in dealing with human behavior and attitudes one finds himself awed at the "inability" not only to measure, but even to discover consensus as to what the behavior or the attitude really is.

Guttman has recently formulated, and discussed in detail yesterday, what he terms the "First General Law of Attitude"[3], which in turn leads to an operational definition:

To formulate this law requires a clear definition of the universe of observations for attitudes. Such a definition in turn requires definitions of (a) the universe of items or variables and (b) the population to be observed. A necessary and sufficient condition has been proposed for attitude items:

> "An item belongs to the universe of attitude items if and only if its domain asks about behavior in a cognitive / affective / instrumental modality toward an object and its range is ordered from very positive to very negative towards that object."

Given this condition for the universe of content, the First General Law of Attitude can be stated as:

Less technically, the First General Law of Attitude asserts that attitude items toward a given object are not negatively correlated for usual populations (Gratch, 1973, p.36).

"If any two items are selected from the universe of attitude items towards a given object, and if the population observed is not selected artificially, then the population regressions between these two items will be monotone and with positive or zero sign."

Whether the researcher accepts an attitude to be a predisposition to behavior, the behavior itself, or as in the approach of this paper (Jordan, 1971a), a combination of both as an attitude-behavior concept, the problem remains. Needless to say, research is useless unless one can "measure the constructs" under consideration (validity) and can adequately reproduce the same results using the same techniques (reliability).

The quest of facet theory research in general (Guttman, 1959, 1970, 1971; Jordan, 1971a, 1971b) is to quantify the qualitative: to be able to construct a scale, an index, an instrument which will indeed be able to "measure" attitude-behaviors or other aspects of the human condition. Two of the most attractive traits of facet theory are the rigor of its logic and the precision of its "ordering principle" in attempting to introduce the concept of semantic "structure" as a means of quantifying qualitative data (Foa and Turner, 1970).

Guttman defines an attitude as a "delimited totality of behavior with respect to something." Thus, he considers an attitude as a whole, a universe, a totality: composed of interdependent parts, which parts can be subdivided and rearranged in diverse a priori specified ways to represent the given whole.

It is this concept of a content universe or whole, and its parts or components as applied to attitude-behavior, that "allows" the researcher to be able to quantify qualitative data. Basic to facet theory, then, is the concept of set theory. The individual objects in a set are called elements or members of that set. All the possible combinations

of elements derived from the diverse sets under consideration are called a set or a Cartesian set (Elizur, 1970).

In facet analysis the set product is synonymous with the attitude-behavior universe developed herein which encompasses the combinations of all elements from the diverse sets. In this sense, as a profile of elements across sets, facet theory attitude research is multivariate. It considers the many variables, aspects, qualities, or facets which combine to comprise the attitude-behavior universe.

Based on the principles of set theory, there are two basic steps in facet research design. The first step is the development of a rationale for the selection and specification of the basic sets called facets; e.g., aspects or qualitative variables of the attitude-behavior universe, al illustrated in Table 1. Each basic facet is composed of various elements.

The second step is the selection of sets of elements, combinations, or profiles which together form the Cartesian set of the facets of the total universe under consideration. These new sets, profiles, or combinations may be called attributes, subuniverses or subscales; which in this research are divided into attitude-behavior levels by "degree of strength", or interpersonal itimacy; i.e., of subject-object interaction, as shown in Tables 1 and 2. Although the five, two-element facets of Table 1 permit the generation of 32 combinations or profiles it has been established elsewhere that only 12 of these are logically and semantically consistent, psychologically relevant, and nonredundant. These 12 profiles group into six "levels of strength." Six of these profiles, one at each level of strength, (Table 2) have been chosen for the attitude-behavior scales (ABS) and the research discussed herein. The rationale for the selection is extensively discussed elsewhere (Jordan, 1971a, 1971b).

TABLE 2 about here

Facet scaling, then, is basically a technique employing the theory of facet analysis: "a tool for the organization of ideas" (Foskett, 1963, p.111). Foskett (p. 111) views Guttman's facet analysis as "the coordination of elements from sets which together add up to the whole content of research projects."

Although Guttman rejects factor analysis as a means for quantifying data, he considers factor analysis a "predeccessor" to facet analysis. Guttman's primary aim is not to "factorize" the data, but to present a theory and a method of instrument or scale construction in which he "quantifies a class of attributes" by means of predetermined rules of classification. The effect is directed toward scaling the universe of attributes of the area under consideration such that it contains "all" of the attributes under investigation.

Guttman (1970) approaches the actual "quantifying of attributes" in facet theory by a procedure termed structioning. Structioning consists of providing a faceted definitional system (Figure 1) for a set R and is accomplished by mapping R into the Cartesian space of the facets (R=set of rules for classification).

FIGURE 1 about here

This set of rules for classification is decided a priori but not without a rigorous, empirical, and logical rationale; i.e., a "theory". Guttman states (Gratch, 1972, p.35) that a theory can be defined as: "an hypothesis of a correspondance between a definitional system for a universe of observations and an aspect of the empirical structure of those observations, together with a rationale for such an hypothesis." Such a theory and methodology attempts to answer such quantitative questions as: "How are the variables under consideration distributed in the population?"

"What are the laws of interrelationships between variables that produce this behavior?" and "Are these laws generalizable to all individuals?" (Kim, Jordan, and Horn, 1972, p.11).

According to scale theory, ordering of the profiles also implies, as Guttman states (1959, p. 320), a formal ordering of the specific categories or elements "within" each facet. In attitude research this methodological approach allows a "known" sampling of appropriate items for the different attitude-levels or subscales (Table 2 and Figure 1), and also enables the prediction of relationships between the different substructures (profiles) of the attitude universe.

In this research, joint struction (Guttman, 1970a) is restricted to the "ordering" depicted in the five facets of Table 1. Structioning is operationally defined as the ordered sets of the five facets of Table 1, from low (subscript "1") to high("subscript "2"), across all five facets simultaneously (Jordan, 1968, p.76); leading to six levels of attitude-behavior strength. Low (subscript "1") represents a cognitive-other-passive orientation and high (subscript "2") represents an affective-self-action orientation (Kim, et.al., 1974, p.6).

It is this quantitative rank ordering or joint struction, measuring the increasing strength of attitude-behavior from a "weak" cognitive-other-passive orientation to a "strong" affective-self-action orientation, that quantifies the qualitative data and lays the foundation for considering the multidimensional aspect of attitude-behavior.

The resulting six levels derived from the combinations of the facet-elements can thus be ordered from weakest to strongest, vis-a-vis subject-object interaction; depending on the number of "strong" facet elements appearing in each level. Using this type of struction or ordering, one arrives at a multivariate attitude-behavior content universe which is "scaled" into six levels, each progressive level, from one to six con-

taining from zero to five "strong" facet-elements (Table 2).

The following analysis defines the joint struction or "ordering" rationale as applied by Guttman-Jordan to the facet-elements of Table 1 (Kim, et.al., 1972, p.6).

> Facet A-the referent "other" (a_1) is weaker than the referent "self"-I (a_2) in being less personal.
>
> Facet B- "belief" (b_1) is weaker than "experience"- overt behavior (b_2) in being "passive" rather than "active".
>
> Facet C- referring to the behavior of one's "self"-mine/my (c_2), rather than of "others" (c_1), is stronger in that it implies personal involvement.
>
> Facet D- in behavioral terms, "comparison" (d_1) is weaker than "interaction" (d_2) since it does not imply social contact. A member of some identified group (i.e. the attitude object) is seen by the subject in comparison to members of some group- his own or another- without any necessary implication of interactions between S and the members of the other group.
>
> Facet E- "hypothetical" behavior (e_1) is weaker than "operational" (e_2) in that it does not imply acting-out behavior.

As is obvious, there is a rank order underscoring the joint struction facet-elements in this design. Guttman refers to it as a progression from a weak to a strong form of the subject's behavior vis-a-vis the attitude object. The more subscript "2" elements a profile contains the greater the strength of the attitude-behavior at that particular level. In summary, there is a progression through (Table 2) the subscale levels, "stereotype" (level 1), being the weakest, proceeding through to "personal interaction" (level 6) the strongest. Table 2 represents the special case in which all the facets are monotonic functions of the rank order specified in the ordering principle by the number of weak-strong elements of interpersonal interaction.

Elsewhere I have also attempted to establish an ordering principle (Jordan, 1971b) for the attitude item content itself so that it too could be "ordered" with some explicit a priori semantic meaning, rather than attempting to a posteriori evolve the meaning by some procedure such as factor analysis. Guttman calls this type of ordering "lateral struction"

and the rationale I earlier proposed considered three main principles in the selection of the item content (Figure 1) in an attitude-behavior scale.

1. Relevance of the content-area for the subject: Low-high. Is "situation y" relevant and/or important to the subject?

2. Ego involvement of subject: Cognitive-affective. Is the "attitude object in situation y" dealt with cognitively or affectively by the subject?

3. Social distance between subject and attitude-object: Distant-close. Is subject's "self" touched in situation y by the attitude object?

Consistent with the above discussion of the weak-strong principle in the evaluation of facets A-E and the attitude levels 1-6, a positive or stronger attitude in the lateral struction would be expressed by a subject who "agreed with or chose" items that dealt with the attitude object in "highly important situations that involved the 'self' of the S in close interpersonal action."

By combining the content ordering, or lateral struction, with the joint struction ordering of the six attitude-behavior levels, several doctoral students and I have developed a number of ABS type measures of attitude-behaviors toward varied "attitude objects" (Bray and Jordan, 1973; Dell Orto and Jordan, 1974; Hamersma, Paige, and Jordan, 1973; Harrelson, Jordan, and Horn, 1972; Jordan, 1974; Jordan and Brodwin, 1974). Although each ABS can be differentiated by its content and/or attitude object, the underlying joint struction/ordering provides the researcher a social psychological basis for predicting the structure of the empirical intercorrelation matrix of its six levels into a specific type of matrix: a simplex, as shown in Table 3.

TABLE 3 about here

This prediction was stated by Guttman (1959) as the contiguity hypothesis: i.e., "Subuniverses closer to each other in the semantic

scale of their definitions will also be closer statistically" (p.324). The contiguity hypothesis postulates that levels adjacent to one another will correlate to a stronger degree than will levels that are more distant from each other. In other words, "Societal Norm" (level 2) will correlate more highly with a closer level, "Personal Hypothetical Action" (level 4) than it will with "Personal Action" (level 6), a more distant level.

Nevertheless, Guttman (1950a, 1950b) does caution the researcher concerning the ordering principle: "One cannot presume to predict the exact size of each correlation coefficient from knowledge only of the semantics of universe ABC, but we do propose to predict a pattern or structure for the relative sizes of the statistical coefficients from purely semantic considerations" (Guttman, 1959, p.324).

Facet analysis provides a means of selecting items from an infinite sample of items that are representative of the particular dimensionality of the scale being constructed. That a rank order of subjects can be established for material that is qualitative in nature is especially significant. By means of a semantic facet analysis, qualitative data can be interpreted through quantitative means. The qualitative variable is given quantitative significance "such that each attribute in the universe of attributes is a simple function of that quantitative variable" (Guttman, 1950b, p.88).

My recent summary (Kim, Jordan and Horn, 1972) of the results obtained from the application of the multidimensional facet theory approach in numerous attitude-behavior studies serves a summary of the attitude facet procedure.

The importance of a facet-designed approach to attitude research, and the results obtained thereby, can be considered under three aspects: (a) methodological, (b) theoretical, and (c) applied.

1. The facet-theory approach has proved a powerful tool in (a) defining research problems, (b) finding relationships within and among variables, (c) dealing with problems of relevancy, equivalency, and comparability in cross-cultural research, and (d) assisting in the analysis and interpretation of empirical data.

2. Certain aspects of attitude-behavior are cross-culturally invariate i.e., the simplex-determined largely by structure of the object-subject relationship.

3. Certain aspects of attitude-behavior are object specific.

4. Certain aspects of attitude-behavior are situation specific (racial attitude-behaviors in New Zealand are quite similar in structure to those in the U.S. but more equalitarian in magnitude).

5. Certain aspects of attitude-behavior may be personality specific, as has been demonstrated in the authoritarian personality studies.

6. Knowledge per se about the attitude object does not generally lead to attitude positiveness.

7. Amount of contact per se increases attitude intensity but not positiveness unless accompanied by (a) enjoyment of the contact and (b) perceived voluntariness of the contact. Notwithstanding Zajonc (1968), mere exposure "is not" enough.

8. Attitude positiveness is related to a value-affective-contact base rather than a cognitive-knowledge one.

9. Attitude-behavior change must be approached multidimensionally: knowledge in more related to Stereotypic and Normative Levels and contact, values, and enjoyment factors are more related to the Actual Feeling and Action (acting-out) Levels.

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[2]Requests for reprints should be addressed to: John E. Jordan, Ph.D. College of Education, Department of Human Development, Louisiana State University, Baton Rouge, Louisiana 70803.

[3]The term "General" was added in personal conversations with Guttman at Cornell University, September 25, 1973.

TABLE 1

Facets Used to Determine Joint Struction[a] of an Attitude Universe

(A) Referent	(B) Referent Behavior	(C) Actor	(D) Actor's Intergroup Behavior	(E) Domain of Actor's Behavior
a_1 others	b_1 belief	c_1 others	d_1 comparison	e_1 hypothetical
a_2 self (I)	b_2 experience (overt behavior)	c_2 self (mine/my)	d_2 interaction	e_2 operational

[a]Joint struction is operationally defined as the ordered sets of the five facets from low to high (subscript 1's are low) across all five facets simultaneously.

Joint Level, Profile Composition, and Labels for Six Types of Attitude Struction

Subscale Type-Level	No.[a]	Profile by Definitional[b] System	Profile by Notational System in Table 1	Attitude Level Descriptive Term
1	0	o b o c h	$a_1b_1c_1d_1e_1$	Societal Stereotype
2	1	o b o i h	$a_1b_1c_1d_2e_1$	Societal norm
3	2	i b o i h	$a_2b_1c_1d_2e_1$	Personal moral evaluation
4	3	i b m i h	$a_2b_1c_2d_2e_1$	Personal Hypothetical action
5	4	i e m i h	$a_2b_2c_2d_2e_1$	Personal feelings
6	5	i e m i p	$a_2b_2c_2d_2e_2$	Personal action

[a] Number of strong elements.

[b] Facet elements of Table 1
A=o or i
B=b or e
C=o or m
D=c or i
E=h or p

TABLE 3

A Simplex for Six Variables

	1	2	3	4	5	6
1	---					
2	.55	---				
3	.39	.45	---			
4	.27	.30	.70	---		
5	.24	.28	.62	.86	---	
6	.21	.24	.59	.82	.88	---